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12/12/84

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November 27, 1984

Mr. Doug Lowery
Alaska Department of
Environmental Conservation
675 Seventh Street
Fairbanks, AK 99701

SUBJECT: Periodic O₂ Monitoring Plan - SIP Heaters
Prudhoe Bay Unit, Permit No. 8436-AA006

Dear Mr. Lowery:

Enclosed for your review and approval is the proposed periodic monitoring plan for the gas-fired heaters at the Seawater Injection Plant (SIP) permitted in the Prudhoe Bay Unit Permit No. 8436-AA006. This plan is submitted to comply with the permit conditions No. 6 as well as the emission monitoring requirement No. 6(b) of PSD-X81-01. These permit stipulations require the submittal of a plan describing a periodic monitoring program using a portable CO or O₂ analyzer for process heaters larger than 43mmBtu/hr.

The rationale for the monitoring program is to insure good operation and maintenance of the heaters and to comply with the BACT requirements for CO. The maintenance of low oxygen levels is desirable to a point, for good NO_x control and good fuel efficiency; however, very low oxygen content can result in higher CO emission. To maintain proper oxygen levels adjustments for excess oxygen are generally made with damper controls.

While ~~we~~ are willing to commit to periodic monitoring at the SIP we question the validity of this monitoring for the following reason. The design of the two supplementary fired Waste Heat Recovery Units (WHRU) does not include damper controls, therefore combustion air adjustments cannot be made. This is explained further in the plan.

It should also be pointed out, that the two Broach Heaters at the SIP have emergency standby status and are used when the WHRU are down. Therefore no periodic O₂ monitoring is proposed for these units.

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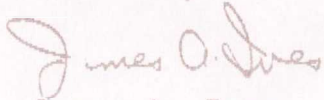


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Mr. Doug Lowery
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We request your approval of this proposed plan. Please advise me at (907) 263-4307 if you have any questions.

Sincerely,



James A. Ives
Sr. Regulatory Compliance Engineer

JAI:tlh-0058

Attachment

cc: Mike Johnston, EPA Region X - w/attachment
Dave Estes, ADEC - Juneau - w/attachment

PROPOSED METHOD
OF
PERIODIC MONITORING
GAS FIRED HEATERS
SEAWATER INJECTION PLANT
PRUDHOE BAY, ALASKA

I. General Information

The Seawater Injection Plant (SIP) is equipped with four fired heaters to provide process heat, emergency flow line heat and emergency building heat. All four heaters can be fired on fuel gas or residue gas. Residue gas is field off-gas prior to transfer to the Central Compressor Plant for re-injection.

Two of the heaters (G. C. Broach Co.) are for emergency use and put in service only if, during the winter; a booster pump fails, booster pump waste heat recovery unit (WHRU) fails, or the entire SIP shuts down. These units supply emergency building heat and enough process heat to keep the water shipping lines from freezing. The units are normally shutdown and require a manual start. See Attachment 1 for design and operating details.

The two process heaters (Econotherm) are supplementary fired waste heat recovery units inside the injection pump turbine exhaust stacks. The injection pumps and supplementary fired WHRU's will normally be operated at maximum rate. Design and operating details are given in Attachment 1 and a schematic diagram of the process is given in Figure A. These heaters are used to heat incoming seawater from 40°F to 70°F, the injection temperature. The system consists of two identical units connected in parallel to a common heating medium system of 60/40, glycol/water. Each WHRU consists of; a heat exchanger picking up the heat in the turbine exhaust gas, a Coen direct fire duct heater to add more heat (required by the seawater), and a second heat exchanger to pick up the heat added by the burner. The glycol from the WHRU's goes to four parallel plate heat exchangers where available heat is transferred to the seawater.

II. Manufacturers Recommended Operating Parameters

A. Emergency Heaters (G. C. Broach Co.):

The G. C. Broach Co. heaters use Coen dual air zone low NO_x burners designed for operation with 10% excess air (2% O₂ in the flue gas). The desired O₂ content is set by varying manual dampers at full firing rate. Automatic dampers are then set at minimum rate and checked at several intermediate rates up to maximum. The automatic dampers then control flue gas O₂ at all firing rates.

B. Process Heaters (Econotherm WHERU):

The Econotherm waste heat recovery units use Coen Co. gas fired duct burners designed for operation with no less than 15% O_2 combustion gas to the burner. This 15% O_2 is in the discharge gas of the Rolls-Royce RB211 gas turbines driving the seawater injection pumps. Since the water pumping rate is independent of the duct burner firing rate, excess O_2 in the flue gas is not specified by the manufacturer.

III. Proposed Monitoring Procedure

A. Sample Points:

Each fired heater exhaust stack has a sample port located at least 2 diameters from the nearest flow interruption. The port consists of a $\frac{1}{2}$ " stainless steel stinger to the center of the stack connected to the nearest platform by $\frac{1}{2}$ " stainless steel tubing. A rotameter and shutoff valve is located at this level.

B. Instrumentation:

Monitoring will be done using Bacharach Instrument Co. model GPK oxygen/combustible gas indicator. These instruments are portable units with internal filtration.

C. Calibration:

Prior to the test, the indicator will be calibrated on ambient air using the manufacturers recommended procedure.

D. Monitoring Frequency:

1. G. C. Broach Co. Emergency Fired Heaters: These heaters are in emergency standby only and will not be normally in operation. No routine emissions monitoring of these units is proposed.
2. Econotherm Waste Heat Recovery Units: These units will be monitored and recorded once each three months.

E. Procedure (Econotherm WHERU):

1. Insure the WHERU to be tested is on line and the burner fired.
2. Calibrate portable oxygen/combustibles indicator as per manufacturers instructions.
3. Open valve on sample line. Clean sample line using utility air to blow out any contamination.
4. With oxygen indicator running, connect it to sample line using $\frac{1}{2}$ " connector. Check rotameter to insure approximately 2.5 liter/minute is being pulled through the line.

5. After 1 minute, read and record oxygen level. Also record fuel gas rate to burner, stack temperature and gas generator percent speed.

F. Record Keeping:

The above information will be recorded on a data sheet for each unit (see Table I). Records will be kept at SIP for at least two years.

ATTACHMENT 1
FIRED EQUIPMENT

EMERGENCY HEATERS

Supplier: G. C. Broach Co.

Type: Direct Fired, Dual Burner, Forced Draft

Thermal Efficiency: 91%+

Thermal Rate: 51.54MM BTU/Hour

Burner Data: Type - Coen DAZ-18 Low NO_x

Combustion Air - 14,170 SCFM (10% excess air)

Fuel - 76,100 SCFH Fuel Gas

71,400 SCFH Residue Gas

Mechanical Specifications: Tubes - 4 Pass

Firebox Temperature: 2,300°F

Liquid Specifications: Type - 60/40 Glycol/Water

Rate - 1,440 GPM (756,866#/Hour)

Temperature In - 150°F

Temperature Out - 235°F

PROCESS HEATERS

Supplier: Econotherm Energy Systems Corp.

Type: Waste Heat Recovery Unit with Supplemental Firing

Thermal Efficiency: 92%+

Thermal Rate: 75MM BTU/Hour - Primary Coil

180MM BTU/Hour - Secondary Coil

Burner Data: Type - Coen Gas Fired Duct Burner, 200MM BTU/Hour

Combustion Air - 766,080 lb./hour, 15% O₂ Minimum

Fuel - 229,885 SCFH Fuel/Residue Gas

Mechanical Specifications: Primary Heat Exchanger Tubes - 30 Pass

Secondary Heat Exchanger Tubes - 60 Pass

Fired Section Temperature - 1,400°F

Liquid Specifications: Type - 60/40 Glycol/Water

Rate - 0.72MM lbs/Hour - Primary

1.65MM lbs.Hour - Secondary

Temperature In - 80°F (Both)

Temperature Out - 220°F (Both)

SEAWATER INJECTION PLANT WASTE HEAT RECOVERY UNIT PROCESS FLOW DIAGRAM

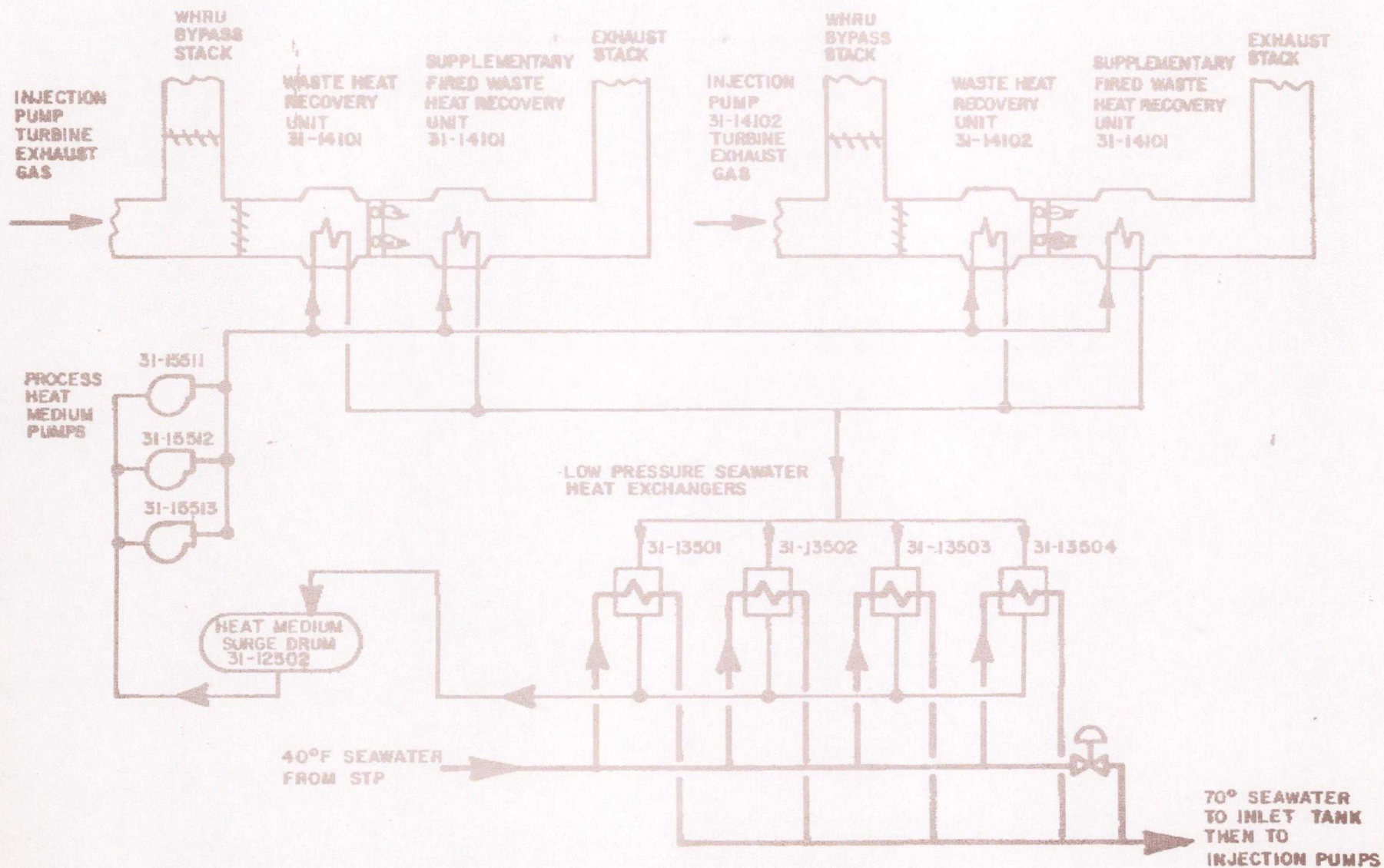


FIGURE A

UNIT DESCRIPTION _____

TAG NO. _____ MAXIMUM FUEL GAS RATE (SCFH) _____